

BIOGRAPHICAL SKETCH

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NAME: Key, Alexandra Pavlovna

POSITION TITLE: Research Associate Professor of Hearing & Speech Sciences

eRA COMMONS USER NAME (credential, e.g., agency login): keysasha

EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Moscow State University, Russia	BA	06/96	Psychology
Moscow State University, Russia	MA	06/97	Psychology
University of Louisville, Louisville, KY	PhD	04/02	Experimental Psychology (Cognitive)

A. Personal Statement

Dr. Key has a broad background in cognitive and developmental psychology as well as psychophysiology and over 15 years of research experience using event-related potentials (ERP) in studies of neurodevelopmental disorders. She acquired the skills necessary to use psychophysiological methodologies to study the neural mechanisms of cognition in infants and children at risk for developmental disabilities during her doctoral training under the guidance of Dr. Dennis Molfese. At the Vanderbilt Kennedy Center (VKC), Dr. Key's research activities focus on psychophysiological indices of sensory and cognitive processes, their use to understand mechanisms of deficits (e.g., cognitive strengths and weaknesses in developmental disabilities), identify markers of risk for adverse developmental outcomes (e.g., autism, developmental delays), and document treatment effects. She has directed the Psychophysiology Services since 2004 and established effective lab procedures that maximize participants' comfort and result in increased compliance with the psychophysiological assessments. Across projects and participant age groups, our average attrition rate for noncompliance with EEG procedures is less than 10%, and less than 20% of collected data are discarded due to excessive artifacts. Dr. Key supports VKC investigators and their staff/students by providing education and training on psychophysiological research methods and by actively collaborating on research projects involving participants with typical and atypical development who span the entire age spectrum from premature infants through aging adults. Several of these collaborations involved the development of novel EEG-based assessment procedures for evaluating sensory or cognitive processing without the need for overt behavioral responses from the participants. Thus, Dr. Key's expertise in applying psychophysiological measures to study cognitive processes in participants with developmental disabilities and established research relationship with investigators across multiple departments enable her to effectively coordinate EEG/ERP components of the Translational Neuroimaging core services and support Core users in the areas of EEG/ERP experiment design, data acquisition, processing, analysis, and interpretation.

- a) Key, A., Dove, G., & Maguire, M. (2005). Linking brainwaves to the brain: An ERP primer. *Developmental Neuropsychology*, 27, 183-215. PMID: 15753046
- b) Key, A., Lambert, W., Aschner, J., & Maitre, N. (2012). Influence of gestational age and postnatal age on speech sound processing in NICU infants. *Psychophysiology*, 49(5), 720-731. PMID: PMC3324622
- c) Key, A., & Yoder, P. (2013). Equiprobable and oddball paradigms: Two approaches for documenting auditory processing. *Developmental Neuropsychology*, 38(6), 402-417. PMID: 23971492

B. Positions and Honors

Positions and Employment

- 1994 – 1996 Research Assistant, Moscow State University, Cognitive Processes Lab
- 1995 – 1996 Research Assistant, Slippery Rock University, Language Development Lab
- 1996 – 1997 Research Assistant, University of Louisville, Cognition and Development Lab
- 1997 – 1998 Research Associate, University of Louisville, Cognitive Neuroscience Lab, School of Medicine
- 1997 – 1999 Research Assistant, University of Louisville, Cognition and Language Lab
- 1999 – 2002 Research Assistant, University of Louisville, Developmental Neuropsychology and Electrophysiology Lab
- 1998 – 2000 Instructor, Cognitive Psychology, University of Louisville
- 2002 – 2004 Research Associate, University of Louisville, Developmental Neuropsychology and Electrophysiology Lab/Early Childhood Research Center
- 2004 – 2012 Research Assistant Professor, Department of Hearing and Speech Sciences, Vanderbilt University
- 2012 – Research Associate Professor, Department of Hearing and Speech Sciences, Vanderbilt University
- 2004 – Director of Psychophysiology Core Services, Vanderbilt Kennedy Center for Research on Human Development, Vanderbilt University

Other Experience and Professional Memberships

- 2002 Member, International Neuropsychological Society
- 2003- Member, Society for Research on Child Development
- 2005-06 Cure Autism Now! Peer Review Committee, reviewer
- 2008- Member, International Society for Autism Research
- 2008- Editorial Board, Developmental Neuropsychology
- 2008 AutismSpeaks Peer Review Committee, ad hoc reviewer
- 2013-14 NIH Peer Review Committee: Child Psychopathology and Developmental Disabilities, ad hoc reviewer

Honors

- 2002 Graduate Dean Citation for research and academic performance, University of Louisville, KY.
- 2002 Research! Louisville Second Place Award for Innovation in Behavioral Science, University of Louisville, KY and Jewish Hospital Foundation.
- 2002 Research! Louisville First Place Award for Innovation in Behavioral Science, University of Louisville, KY and Jewish Hospital Foundation.
- 2003 Research! Louisville Second Place Award for Innovation in Behavioral Science, University of Louisville, KY and Jewish Hospital Foundation.
- 2008 Merit Award, 35th Annual Meeting of the International Neuropsychological Society, Waikoloa, Hawaii.

C. Contributions to Science

1. Established the utility of ERP methodology for characterizing neurocognitive phenotypes associated with genetic and environmental factors related to IDD.

Standardized behavioral assessments and caregiver reports are not always sensitive to the full range of individual differences in persons with IDD and do not allow the direct study of neural mechanisms underlying observable performance. Dr. Key's work established that auditory and visual ERP paradigms not requiring active responses by the participant could be successfully used across the life span and diagnostic groups and reflect quantitative differences in neurocognitive function associated with adverse environmental exposures (e.g., prenatal exposure to nicotine or cocaine), atypical physiological functioning, and genetic differences related to IDD.

- a) Key, A., Ferguson, M., Molfese, D., Peach, K., Lehman, C. & Molfese V. (2007). Smoking during pregnancy affects speech discrimination ability in newborn infants. *Environmental Health Perspectives*, 115(4), 623-629. PMID: PMC1852679.

- b) Key, A., Molfese, D.L., O'Brien, L., & Gozal, D. (2009). Sleep-disordered breathing affects auditory processing in 5-7 year-old children: evidence from brain recordings. *Developmental Neuropsychology*, 34(5), 1-15. PMID: PMC2937156
- c) Key, A., & Stone, W. (2012). Same but different: Nine-month-old infants at low and high risk for autism look at the same facial features but process them using different brain mechanisms. *Autism Research*, 5, 253-266. PMID: PMC3422441
- d) Key, A., Jones, D. & Dykens, E.M. (2013). Social and emotional processing in Prader-Willi syndrome: Genetic subtype differences. *Journal of Neurodevelopmental Disorders*, 5:7. PMID: PMC3637538

2. Demonstrated the effectiveness of ERP measures as predictors of developmental outcomes and markers of treatment effects in individuals with developmental disabilities.

Early identification of risk for poor developmental outcomes, especially prior to the emergence of behavioral symptoms, is essential to the design, implementation and maximal effectiveness of early interventions. Dr. Key's lab documented the utility of passive auditory ERP paradigms in preterm infants and children with developmental disabilities as predictors of cognitive and communicative functioning. These results paved the way for using ERP as outcome measures in pharmacological and behavioral interventions aiming to compensate for the effects of prematurity and/or brain injury. The ERP results in these studies demonstrated that treatments targeting specific behaviors have a broader impact on neural functioning, including improvements in other domains supported by shared neural mechanisms.

- a) Lemons, C.J., Key, A.P.F., Fuchs, D., Yoder, P.J., Fuchs, L.S., Compton, D.L., Williams, S.M., & Bouton, B. (2010). Predicting reading growth with event-related potentials: Thinking differently about indexing "responsiveness." *Learning and Individual Differences*, 20(3), 158-166. PMID: PMC2877269
- b) Maitre, N., Lambert, W., Aschner, J., & Key, A. (2013). Cortical speech sound discrimination in the intensive care nursery predicts cognitive and language development through 2 years of age. *Developmental Medicine & Child Neurology*, 55(9), 834-839.
- c) Maitre, N., Henderson, G., Gogliotti, S., Pearson, J., Simmons, A., Wang, L., Slaughter, J., & Key, A. (2014). Feasibility of ERP methodology to evaluate changes in cortical processing after rehabilitation in children with cerebral palsy: A pilot study. *Journal of Clinical and Experimental Neuropsychology*, 36(7), 669-679. PMID: 24953907.
- d) Maitre, N., Aschner, J., Stark, A., & Key, A. (2014). Effects of caffeine treatment for apnea of prematurity on cortical speech sound differentiation in preterm infants. *Journal of Child Neurology*. PMID: PMC4269579

3. Developed innovative ERP-based assessments of sensory and cognitive processes optimized for use in participants with IDD.

Evaluating sensory and cognitive processes in infants and in individuals with IDDs is challenging due to the limited range and low reliability of overt behavioral responses, difficulty comprehending instructions, and reduced motivation and/or attention span. Dr. Key's laboratory developed novel, nonverbal, IQ-independent, ERP-based assessments of tactile processing, memory, and social motivation, and demonstrated their utility in studies of diverse populations of individuals with IDDs. This line of work also led to studies examining the psychometric properties of these paradigms and the analytic approaches necessary to facilitate the translation of ERPs from an exclusively research to a diagnostic tool.

- a) Maitre, N., Barnett, Z., & Key, A. (2012). Novel assessment of cortical response to somatosensory stimuli in children with hemiparetic cerebral palsy. *Journal of Child Neurology*, 27(10), 1276-1283. PMID: PMC3744820
- b) Yoder, P., Molfese, D., Murray, M., & Key, A. (2013). Normative topographic ERP analyses of speed of speech processing and grammar before and after grammatical treatment. *Developmental Neuropsychology*, 38(8), 514-533. PMID: PMC3873727
- c) Key, A., & Dykens, E. M. (2014). Event-related potential index of age-related differences in memory processes in adults with Down syndrome. *Neurobiology of Aging*, 35(1), 247-253. PMID: PMC3849808

- d) Key, A., & Corbett, B. (2014). ERP responses to face repetition during passive viewing: A nonverbal measure of social motivation in children with autism and typical development. *Developmental Neuropsychology*, 39(6), 474-495. PMID: PMC4142544

Complete List of Published Work in MyBibliography:

<http://www.ncbi.nlm.nih.gov/sites/myncbi/alexandra.key.1/bibliography/47294536/public/?sort=date&direction=ascending>

D. Research Support

Ongoing Research Support

5P30 HD015052-31 Dykens (PI) 07/01/2009 – 06/30/2015

NIH/NICHHD

The Eunice Kennedy Shriver Intellectual and Developmental Disability Research Center

This grant provides core support for The Eunice Kennedy Shriver Intellectual and Developmental Disability Research Center at Vanderbilt University.

Role: Faculty Coordinator, VKC Psychophysiology Services

5R01 HD035684-13 Dykens (PI) 07/01/2010 – 05/31/2015

NIH/NICHHD

Predicting Phenotypic Trajectories in Prader-Willi Syndrome

The goal of this project is to specify the types and neurobiological correlates of psychiatric symptoms in people with PWS across the life span, and to compare psychiatric findings across genetic subtypes, and to those with autism spectrum disorder.

Role: Co-Investigator

HeART Award #3106 Peters & Key (co-PIs) 10/01/2014 – 09/30/2016

International Rett Syndrome Foundation

Auditory processing, language, and learning in Rett and Rett-related disorders

The goal of this project is to develop novel, objective, auditory ERP-based measures for evaluating higher level cognitive and language functions in children with Rett and MECP2 duplication syndromes.

Role: Co-PI

1K23HD074736-01 Maitre (PI) 04/01/2014-03/31/2017

NIH/NICHHD

Multimodal Evaluation of Sensory Processing and Neurodevelopment in NICU Infants

The goal of this project is to develop novel, ERP-based tools for evaluating the influence of intensive-care environmental exposures and neural injury on auditory/tactile unisensory and multisensory functioning in infants.

Role: Co-Investigator

R324A110266 Bess (PI) 07/01/2011 – 06/30/2015

IES

Fatigue and Listening Effort in School-Age Children with Hearing Loss.

The goal of this project is to examine whether school-age children with hearing loss expend greater listening effort and subsequently experience more fatigue than children with no hearing loss and to assess the impact of hearing-related fatigue on skills essential for learning in school.

Role: Co-Investigator

1R21MH103518-01 Sarkar (PI) 04/01/2014-03/31/2016

NIH/NIMH

Transformative Co-Robotic Technology for Autism Intervention

The project will develop, apply, and via initial pilot study examine the feasibility of a novel adaptive robotic technology as a potential intervention tool for young children with autism spectrum disorders. The proposed 'intelligent' system is designed to automatically adjust intervention tasks based on information about child's eye gaze in order to enhance performance on tasks of early social orienting.

Role: Investigator

Completed Research Support (last 3 years)

5R01 HD057284-04 Stone, Univ of Wash (PI) 09/30/2008 – 07/31/2013

NIH/NICHHD

Social-Emotional Development of Infants At-Risk for Autism Spectrum Disorders

This longitudinal cross-site project with University of Miami examines the early development of attentional and affective mechanisms, their impact on positive joint attention competencies, and their relation to later autism symptomatology. (UW subcontract to VU, Warren, PI)

Role: Co-Investigator

3R01 DC006893-03S1 Yoder (PI) 08/19/2011 – 05/31/2013

NIH/NIDCD

Predicting Useful Speech in Children with Autism

The goal of this project is to improve understanding of the variance in early spoken language development in initially nonverbal preschoolers with ASD, set-up future research to provide empirical guidance in selecting among existing communication treatments, and generate data that will stimulate future development of new communication treatments for nonverbal children with autism.

Role: Co-Investigator